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AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM CONDITIONS OF APPROVAL AND RECIPROCAL RECOGNITION OF APPROVAL FOR MOTOR VEHICLE EQUIPMENT AND PARTS

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UNIFORM PROVISIONS CONCERNING THE APPROVAL OF REAR MARKING PLATES FOR SLOW-MOVING VEHICLES (BY CONSTRUCTION) AND THEIR TRAILERS

UNITED NATIONS

Regulation No. 69

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF REAR MARKING PLATES FOR SLOW-MOVING VEHICLES (BY CONSTRUCTION) AND THEIR TRAILERS

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Regulation No. 69

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF REAR MARKING PLATES FOR SLOW-MOVING VEHICLES (BY CONSTRUCTION) AND THEIR TRAILERS

1. SCOPE

These provisions apply to the approval of rear marking plates used to increase the visibility of the rear of slow-moving vehicles (SMV) which, by construction, cannot travel faster than 30 km/h, and of their trailers, and for permitting easy identification of these vehicles.

2. DEFINITIONS 1/

2.1 For the purpose of these provisions, the following definitions shall apply:

2.1.1 "SMV rear marking plate" a triangular plate with truncated corners with a characteristic pattern faced with retroreflective and fluorescent material or devices.

2.1.2 "Sample unit" a complete, finished SMV plate ready to be mounted on a vehicle and representative of current production.

2.2 Retroreflection

Reflection in which radiation is returned in directions close to the direction from which it came, this property being maintained even over wide variations of the direction of the incident radiation:

2.2.1 "Retroreflective material" a surface or device from which, when directionally irradiated, a relatively large portion of the incident radiation is retroreflected.

2.2.2 "Retroreflective device" an assembly ready for use and comprising one or more retroreflective optical units.

2.3 Geometric definitions (see annex 1, figure 1).

2.3.1 "Reference centre" a point on or near a retroreflective area which is designated to be the centre of the device for the purpose of specifying its performance.

1/ The definitions of technical terms are those adopted by the International Commission on Illumination (CIE) - see Technical Report on Retroreflection, CIE Publication No. 54.

2.3.2 "Illumination axis" a line segment from the reference centre to the light source.

2.3.3 "Observation axis" a line segment from the reference centre to the photometer head.

2.3.4 "Observation angle (Symbol α)" the angle between the illumination axis and the observation axis. The observation angle is always positive and, in the case of retroreflection, is restricted to small angles.

Maximum range: $0 \leqslant \alpha \quad 180°$.

2.3.5 "Observation half-plane" the half-plane which originates on the illumination axis and which contains the observation axis.

2.3.6 "Reference axis" a designated line segment originating on the reference centre which is used to describe the angular position of the retroreflective device.

2.3.7 "Entrance angle (Symbol β)" the angle from the illumination axis to the reference axis. The entrance angle is usually not larger than 90° but, for completeness, its full range is defined as $0 \leqslant \beta \leqslant 180°$. In order to specify the orientation in full, this angle is characterized by two components, β 1 and β 2.

2.3.8 "First axis" an axis through the reference centre and perpendicular to the observation half-plane.

2.3.9 "First component of the entrance angle (Symbol β 1)" the angle from the illumination axis to the plane containing the reference axis and the first axis. Range: $-180° < \beta_1 \leqslant 180°$.

2.3.10 "Second component of the entrance angle (Symbol β_2)" the angle from the plane containing the observation half-plane to the reference axis. Range: $-90° \leqslant \beta_2 \leqslant 90°$.

2.3.11 "Second axis" an axis through the reference centre and perpendicular to both the first axis and the reference axis. The positive direction of the second axis lies in the observation half-plane when $-90° < \beta_1 < 90°$ as shown in annex 1, figure 1.

2.4 Definition of photometric terms

2.4.1 "Coefficient of luminous intensity" the quotient obtained from dividing the luminous intensity (I) of the retroreflective area in the direction of observation by the illuminance ($E \perp$) at the retroreflector on a plane perpendicular to the direction of the incident light.

Symbol R $\qquad R = \frac{I}{E\perp}$

Note: In the photometry of retroreflectors, this coefficient is expressed in millicandelas per lux (mcd. lx^{-1}).

2.4.2 "Angular diameter of the retroreflective sample (Symbol η)" the angle subtended by the greatest dimension of the retroreflective sample, either at the centre of the source of illumination or at the centre of the receiver.

2.4.3 "Luminance factor" the ratio of the luminance of the body considered to the luminance of a perfect diffuser under identical conditions of illumination and observation.

2.5 Fluorescence

When certain substances are brought near to a source of ultraviolet or blue radiations, they emit radiations which are nearly always of longer wavelength than those producing the effect. This phenomenon is called fluorescence. By day and in twilight, fluorescent colours are brighter than normal colours because they reflect part of the light falling upon them and in addition they emit light. At night, they are not brighter than ordinary colours.

2.6 Description of goniometer

A goniometer which can be used in making retroreflection measurements in the CIE geometry is illustrated in annex 1, figure 2. In this illustration, the photometer head is arbitrarily shown to be vertically above the source. The first axis is shown to be fixed and horizontal and is situated perpendicular to the observation half-plane. Any arrangement of the components which is equivalent to the one shown can be used.

2.7 Definition of "type"

SMV rear marking plates of different types means SMV marking plates which differ in such essential respects as:

2.7.1 The trade name or mark.

2.7.2 The characteristics of the retroreflective material or devices.

2.7.3 The characteristics of the fluorescent material.

2.7.4 The parts affecting the properties of the retroreflective material or devices.

3. APPLICATION FOR APPROVAL

3.1 The application for approval of a type of SMV rear marking plate shall be submitted by the holder of the trade name or mark, or if necessary by his duly accredited representative and shall be accompanied by:

3.1.1 Drawings, in triplicate, sufficiently detailed to permit identification of the type. The drawings shall show geometrically the position in which the SMV rear marking plate is to be fitted to the rear end of the vehicles. They shall also show the position intended for the approval number and the identification symbol in relation to the circle of the approval mark.

3.1.2 A brief description giving the technical specifications of the materials of which the retroreflective areas are made.

3.1.3 A brief description giving the technical specifications of the materials of which the fluorescent area is made.

3.1.4 Samples of the retroreflective and fluorescent areas; the number of samples to be submitted is specified in annex 4.

3.2 The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

4. MARKINGS

4.1 Every SMV rear marking plate submitted for approval shall bear:

4.1.1 The trade name or mark of the applicant.

4.1.2 On the plates whose retroreflective system is not omni-rotational, the word "TOP" inscribed horizontally on the part of the plates which is intended to be the highest part of the plate when mounted on the vehicle.

4.2 The markings shall be applied on either the retroreflective or the fluorescent area of the plate, or on the edge, and shall be visible from the outside when the marking plate is fitted on the vehicle.

4.3 The markings shall be clearly legible and shall be indelible.

5. APPROVAL

5.1 If the SMV rear marking plates submitted for approval in accordance with paragraph 4 above meet the requirements of this Regulation approval for this type of SMV rear marking plate shall be granted.

5.2 An approval number shall be assigned to each type approved. Its first two digits (at present 00 for the Regulation in its original form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another type of SMV rear marking plate.

5.3 Notice of approval or refusal or extension of approval of a type of SMV rear marking plate under this Regulation shall be communicated to the Parties to the Agreement applying this Regulation by means of a form conforming to the model in annex 2 to this Regulation and of a drawing annexed thereto supplied by the applicant for approval, in a format not exceeding A4 (210 x 297 mm) or folded to that format and if possible on a scale of 1:1.

5.4 Every SMV rear marking plate conforming to a type approved under this Regulation shall bear, in addition to the markings prescribed in paragraph 4.1.

5.4.1 An international approval mark consisting of:

5.4.1.1 A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval. */

5.4.1.2 An approval number.

5.5 The approval mark shall be clearly legible and shall be indelible.

5.6 Annex 3 to this Regulation gives an example of the arrangement of the approval mark.

6. GENERAL SPECIFICATIONS

6.1 SMV rear marking plates shall be so constructed that they function satisfactorily and will continue to do so in normal use. In addition, they shall not have any defect in design or manufacture that is detrimental to their efficient operation or to their maintenance in good condition.

6.2 The components of retroreflective/fluorescent SMV rear marking plates shall not be capable of being easily dismantled.

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*/ One for the Federal Republic of Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for Czechoslovakia, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 for the German Democratic Republic, 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal and 22 for the Union of Soviet Socialit Republics. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

6.3 The means of attachment of the SMV rear marking plate shall be such that they allow a stable and durable connection between the plate and the rear end of vehicles, for instance by screws or rivets.

6.4 The outer surface of the retroreflective/fluorescent SMV rear marking plate shall be easy to clean. The surface shall therefore not be rough and any protuberances it may exhibit shall not prevent easy cleaning.

7. SPECIAL SPECIFICATION (TESTS)

7.1 SMV rear marking plates shall also satisfy the conditions as to dimensions, shape, pattern and the colorimetric, photometric, physical and mechanical requirements set forth in annexes 5 to 12 of this Regulation.

7.2 Depending on the nature of the materials of which the SMV rear marking plate is made, the competent authorities may authorize laboratories to omit certain unnecessary tests, provided that such omission is mentioned under "Remarks" on the form notifying approval.

8. MODIFICATIONS AND EXTENSION OF APPROVAL OF REAR MARKING PLATE FOR SLOW-MOVING VEHICLES (BY CONSTRUCTION) AND THEIR TRAILERS

8.1 Every modification of the rear marking plate type shall be notified to the administrative department which granted the type approval. The department may then either:

8.1.1 Consider that the modifications made are unlikely to have appreciable adverse effects and that in any case the type of device still complies with the requirements; or

8.1.2 Require a further test report from the technical service responsible for conducting the tests.

8.2 Confirmation or refusal of approval, specifying the alterations, shall be notified by the procedure specified in paragraph 5.3 above to the Parties to the Agreement applying this Regulation.

8.3 The competent authority issuing the extension of approval shall assign a series number to each communication form drawn up for such an extension.

9. CONFORMITY OF PRODUCTION

9.1 Any SMV rear marking plate approved to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 6 and 7 above.

9.2 In order to verify that the requirements of paragraph 9.1 are met, suitable controls of the production shall be carried out.

9.3 The holder of the approval shall in particular:

9.3.1 Ensure existence of procedures for the effective control of the quality of SMV rear marking plates.

9.3.2 Have access to the control equipment necessary for checking the conformity of each approved type.

9.3.3 Ensure that data of test results are recorded and that annexed documents shall remain available for a period to be determined in accordance with the administrative service.

9.3.4 Analyse the results of each type of test, in order to verify and ensure the stability of the SMV rear marking plate characteristics making allowance for variation of an industrial production.

9.3.5 Ensure that for each type of SMV rear marking plate at least the tests prescribed in annexes 6 through 9 to this Regulation are carried out.

9.3.6 Ensure that if the requirement in paragraph 9.4.3 is not met, a further sample consisting of five specimens shall be taken at random. The average of all like photometric measurements shall be at least equal to the requirement and no individual measurement may be less than 50 per cent of the requirement.

9.4 The competent authority which has granted type approval may at any time verify the conformity control methods applicable to each production unit.

9.4.1 In every inspection, the test books and production survey records shall be presented to the visiting inspector.

9.4.2 The inspector may take samples at random which will be tested in the manufacturer's laboratory. The minimum number of samples may be determined according to the results of the manufacturer's own verification.

9.4.3 The conformity of production shall not be contested if all the photometric measurements of one specimen taken at random are equal to at least 80 per cent of the requirements of annex 7 of this Regulation.

9.4.4 The conformity of production shall not be contested if the colorimetric properties of one specimen taken at random meet the specifications of annex 6 of this Regulation, to be judged by visual inspection.

9.4.5 When the quality level appears unsatisfactory or when it seems necessary to verify the validity of the tests carried out in application of paragraph 9.4.2 the inspector shall select samples to be sent to the technical service which has conducted the type approval tests.

9.4.6 The competent authority may carry out any test prescribed in this Regulation.

9.4.7 The normal frequency of inspections authorized by the competent authority shall be one per two years. In the case where negative results are recorded during one of these visits, the competent authority shall ensure that all necessary steps are taken to re-establish the conformity of production as rapidly as possible.

10. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

10.1 The approval granted in respect of a type of SMV rear marking plate pursuant to this Regulation may be withdrawn if the requirements set forth above are not met or if a marking plate bearing the approval mark does not conform to the type approved.

10.2 If a Party to the Agreement applying the Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties to the Agreement applying this Regulation, by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "APPROVAL WITHDRAWN".

11. PRODUCTION DEFINITELY DISCONTINUED

If the holder of an approval completely ceases to manufacture an SMV rear marking plate approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Parties to the Agreement applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation "PRODUCTION DISCONTINUED".

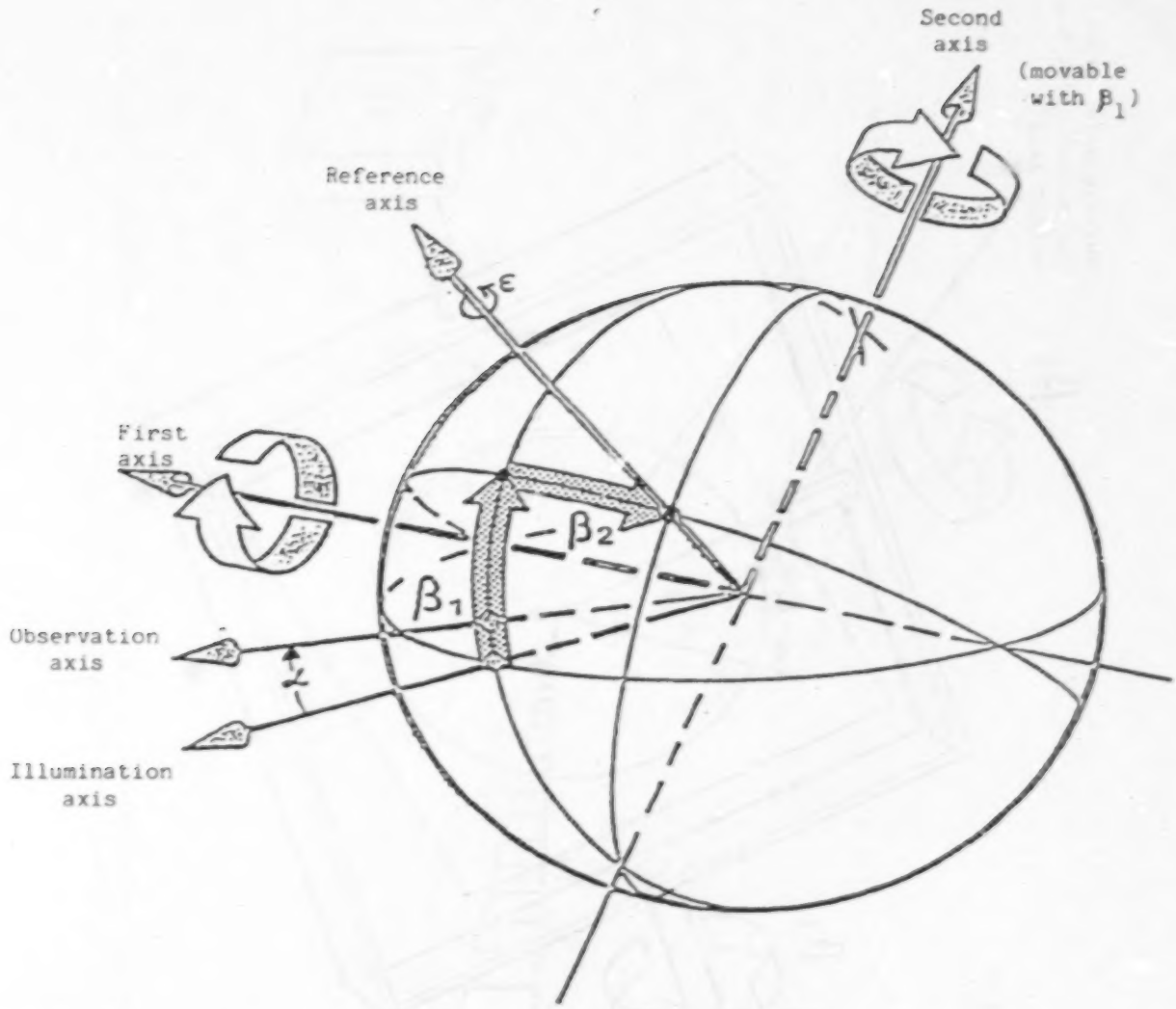
12. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Parties to the Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, issued in other countries, are to be sent.

Annex 1

THE CIE CO-ORDINATE SYSTEM

Figure 1



The CIE angular system for specifying and measuring retroreflectors. The first axis is perpendicular to the plane containing the observation axis and the illumination axis. The second axis is perpendicular both to the first axis and to the reference axis. All axes, angles, and directions of rotation are shown positive.

Notes: (a) The principal fixed axis is the illumination axis.

(b) The first axis is fixed perpendicular to the plane containing the observation and illumination axis.

(c) The reference axis is fixed in retroreflector and movable with β_1 and β_2.

Figure 2

Representation of a goniometer mechanism embodying the CIE angular system for specifying and measuring retroreflectors. All angles and directions of rotation are shown positive.

Annex 2

(Maximum format: A 4 (210 x 297 mm))

1/

E...

Communication concerning: approval
refusal of approval
extension of approval
withdrawal of approval
production definitely discontinued 2/

of a type of SMV rear marking plate, pursuant to Regulation No. 69

Approval No. ..... Extension No. .....

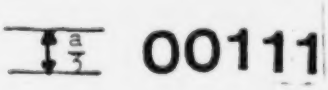
1. Trade name or mark of the SMV rear marking plate: .....
2. SMV rear marking plate type: .....
3. Manufacturer's name and address: .....
.....
4. If applicable, name and address of manufacturer's representative: .....
.....
5. Submitted for approval on: .....
6. Technical service responsible for conducting approval tests: .....
.....
7. Date of test report: .....
8. Number of test report: .....
9. Remarks: .....
.....
10. Vehicles to which the device is intended to be fitted (if applicable): ...
.....
11. Position and nature of the marking: .....
12. Approval granted/refused/extended/withdrawn 2/.....
13. Reason(s) for extension (if applicable): .....
14. Place: .....
15. Date: .....
16. Signature: .....
17. The list of documents deposited at the administrative service which has granted approval is annexed to this communication.

1/ Name of administration.
2/ Strike out what does not apply.

Annex 3

ARRANGEMENT OF THE APPROVAL MARK

a ≥ 5 mm



The SMV rear marking plate bearing the above approval mark has been approved in the Federal Republic of Germany (E 1) under No. 00111. The approval number indicates that the approval was granted in accordance with the requirements of this Regulation in its original form.

Note

The approval number shall be placed close to the circle and either above or below the letter "E" or to the left or right of that letter. The digits of the approval number shall be placed on the same side of the letter "E" and face in the same direction. The use of Roman numerals as approval numbers shall be avoided so as to prevent any confusion with other symbols.

Annex 4

TEST PROCEDURE

TEST SAMPLES

1. Five SMV rear marking plates shall be supplied to the testing laboratory for the various tests to be conducted.

2. The test samples shall be representative of current production, fabricated in accordance with the recommendations of the manufacturer(s) of the retroreflective and fluorescent materials or devices.

3. After verification of the general specifications (paragraph 6 of the Regulation) and the specifications of shape and dimensions (annex 5) four samples shall be subjected to the heat resistance test described in annex 9 to this Regulation, prior to the tests described in annexes 6, 7 and 8. The fifth sample shall be kept for reference purposes during the test procedures.

4. The photometric and colorimetric measurements may be made on the same sample.

5. For the other tests, samples which have not undergone any testing should be used.

Annex 5

SPECIFICATIONS OF SHAPE AND DIMENSIONS

SHAPE AND DIMENSIONS OF RETROREFLECTIVE/FLUORESCENT SMV REAR MARKING PLATES

1. Shape: The plates shall be in the shape of an equilateral triangle with truncated corners, for mounting with one apex upwards at the rear of slow-moving vehicles.

2. Pattern: The plates shall have a red fluorescent centre and red retroreflective borders made of either retroreflective sheeting or coating or of plastic corner-cube reflectors.

3. Dimensions: The length of the base of the enclosed fluorescent triangle shall be: minimum 350 mm and maximum 365 mm. The minimum width of the light emitting surface of the red retroreflective border shall be 45 mm, the maximum width 48 mm. These features are illustrated in the example of annex 12.

Annex 6

COLORIMETRIC SPECIFICATIONS

1. SMV rear marking plates for slow-moving vehicles and their trailers shall be composed of red retroreflective and red fluorescent materials or devices.

2. Red retroreflective material or devices

2.1 When measured with a spectrophotometer in accordance with the provisions of CIE document No. 15 (1971) and illuminated with the CIE Standard Illuminant D_{65} at an angle of 45° to the normal and viewed along the normal (45/0 geometry), the colour of the material in new condition shall be located within the area defined by the chromaticity co-ordinates in table 1 and comply with the luminance factor.

Table 1

Colour		1	2	3	4	Luminance factor
Red	x	0.690	0.595	0.560	0.650	$\geqslant$ 0.03
	y	0.310	0.315	0.350	0.350	

2.2 When illuminated by the CIE Standard Illuminant A at an entrance angle $\beta_1 = \beta_2 = 0°$, or, if this produces a colourless surface reflection, an angle $\beta_1 = \pm 5°$, $\beta_2 = 0°$, and measured at an observation angle of 20', the colour of the material in new condition shall be located within the area defined by the chromaticity co-ordinates in table 2.

Table 2

Colour		1	2	3	4
Red	x	0.720	0.735	0.665	0.643
	y	0.258	0.265	0.335	0.335

Note: The question of the night-time colours of retroreflective materials is at present being studied by CIE TC 1.6; the above limits are therefore only provisional and will be revised later after CIE TC 1.6 has completed its work.

3. Red fluorescent material

3.1 When measured with a spectrophotometer in accordance with the provisions of CIE document No. 15 (1971) and illuminated polychromatically with the CIE Standard Illuminant D_{65} at an angle 45° to the normal and viewed

along the normal (geometry 45/0), the colour of the material in new condition shall be located within the area defined by the chromaticity co-ordinates in table 3 and comply with the luminance factor.

Table 3

Colour		1	2	3	4	Luminance factor
Red	x	0.690	0.595	0.569	0.655	
	y	0.310	0.315	0.341	0.345	$\geqslant$ 0.30

4. Compliance with the colorimetric specifications shall be verified by a visual comparison test.

If any doubt remains after this test, conformity with the colorimetric specification shall be verified by determining the trichromatic co-ordinates of the most doubtful sample.

Annex 7

PHOTOMETRIC SPECIFICATIONS

Photometric properties

1. When illuminated with a CIE Standard Illuminant A and measured as recommended by CIE TC 2.3 (CIE Publication No. 54, 1982), the coefficient of luminous intensity R in millicandelas per lux of the entire red retroreflective area in new condition shall be at least as indicated in table 1.

Table 1

Observation angle (α) in degrees	Entrance angle (β) in degrees				
1/3° (20')	β 1	0	0	0	
	β 2	5	20	30	
R		1,300	850	600	(mcd.lx^{-1})

2. The subtended angle at the sample shall not be larger than 80'.

Annex 8

RESISTANCE TO EXTERNAL AGENTS

1. Resistance to weathering

1.1 Procedure - For each test, two specimens of a sample unit (see paragraph 2.1.2 of this Regulation) are taken. One specimen shall be stored in a dark and dry container for subsequent use as "reference unexposed specimen".

The second specimen shall be subjected to a source of illumination in accordance with ISO Standard 105-B02-1978, Section 4.3.1; the retroreflective material shall be exposed until blue standard No. 7 has faded to No. 4 on the grey scale and the fluorescent material until blue standard No. 5 has faded to No. 4 on the grey scale.

After the test, the specimen shall be washed in a dilute neutral detergent solution, dried and examined for conformity with the requirements specified in paragraphs 1.2 to 1.4.

1.2 Visual appearance - No area of the exposed specimen shall show any evidence of cracking, sealing, pitting, blistering, delamination, distortion, chalking, staining or corrosion.

There shall be no shrinkage in excess of 0.5 per cent in any linear direction and no evidence of adhesion failure such as edge lifting from the substrate.

1.3 Colour fastness - The colours of the exposed specimen shall still meet the requirements in annex 6, tables 1, 2 and 3.

1.4 Effect on the coefficient of luminous intensity of the retroreflective material.

1.4.1 For this check, measurement shall be made only at an observation angle of 20' and an entrance angle of 5' by the method given in annex 7.

1.4.2 The coefficient of luminous intensity of the exposed specimen when dry shall be not less than 80 per cent of the value in annex 7, table 1.

1.4.3 The specimen shall then be subjected to simulated rainfall and its coefficient of luminous intensity under this condition shall be not less than 90 per cent of the value obtained when measured in dry condition, as explained in paragraph 1.4.2 above.

2. Resistance to corrosion (ISO Standard 3768)

2.1 A specimen of the sample unit shall be subjected to the action of a saline mist for 48 hours comprising two periods of exposure of 24 hours each, separated by an interval of 2 hours during which the specimen is allowed to dry.

The saline mist shall be produced by atomizing at a temperature of 35 ± 2°C of a saline solution obtained by dissolving five parts by weight of sodium chloride in 95 parts of distilled water containing not more than 0.02 per cent of impurities.

2.2 Immediately after completion of the test, the sample shall show no sign of corrosion liable to impair the efficiency of the device.

2.2.1 The coefficient of luminous intensity R of the retroreflective area, when measured after a recovery period of 48 hours as specified in annex 7, paragraph 1, at an entrance angle of 5° and an observation angle of 20', shall be not less than the value in annex 7, table 1. Before measuring, the surface shall be cleaned to remove salt deposits from the saline mist.

3. Resistance to fuels

A section of a sample unit not less than 300 mm long shall be immersed in a mixture of n-heptane and toluol, 70 per cent and 30 per cent by volume, for one minute.

After removal, the surface shall be wiped dry with a soft cloth and shall not show any visible change which would reduce its effective performance.

4. Bonding strength (in the case of adhesive materials)

4.1 The adhesion of laminated or coated retroreflective and fluorescent materials shall be determined.

4.2 The coated materials, of whatever kind, shall not be removable without tools or without damaging the material.

4.3 The laminated materials (adhesive films) shall need a force of at least 10 N per 25 mm width at a speed of 300 mm per minute, to be removed from the substrate.

5. Resistance to water

A section of a sample unit not less than 300 mm long shall be immersed in distilled water at a temperature of 23 ± 5°C for a period of 18 hours; it shall then be left to dry for 24 hours under normal laboratory conditions.

After completion of the test, the section shall be examined. No part inside 10 mm from the cut edge shall show evidence of deterioration which would reduce the effectiveness of the plate.

6. Resistance to impact (except for plastics corner-cube reflectors)

When a 25 mm diameter solid steel ball is dropped from a height of 2 m on to the retroreflective and on the fluorescent surfaces of a supported plate, at an ambient temperature of 23 ± 2°C, the materials shall show no cracking or separation from the substrate at a distance of more than 5 mm from the impacted area.

7. Cleaning

A test sample smeared with a mixture of detergent lubricating oil and graphite shall be easily cleaned without damage to the retroreflective or fluorescent surfaces when wiped with a mild aliphatic solvent such as n-heptane, followed by washing with a neutral detergent.

Annex 9

RESISTANCE TO HEAT

1. The four samples shall be kept for 48 hours in a dry atmosphere at a temperature of 65 ± 2°C, after which the samples shall be allowed to cool for 1 hour at 23 ± 2°C. They shall then be kept for 12 hours at a temperature of -20 ± 2°C.

1.1 The sample shall be examined after a recovery time of 4 hours under normal laboratory conditions.

2. After this test, no cracking or appreciable distortion of the surfaces, particularly of the optical units, shall be evident.

Annex 10

RIGIDITY OF THE PLATES

The triangular plate shall be strongly held on one of its long sides, with the clamps of the holding device not encroaching over more than 20 mm. A force of 10N perpendicular to the plane shall be applied to the opposite apex.

The apex shall then not move in the direction of the force by more than 40 mm.

After removal of the force, the plate shall visibly return to its initial position. The residual deflection shall not be more than 5 mm.

Annex 11

STABILITY IN TIME OF THE OPTICAL PROPERTIES 1/ OF REAR MARKING PLATES

1. The authority which granted approval shall have the right to check the stability in time of the optical properties of a type of rear marking plate in service.

2. The competent authorities of countries other than the country in which approval was granted may carry out similar checks in their territory. If a type of rear marking plate in use exhibits a systematic defect, the said authorities shall transmit to the authority which granted approval, with a request for its opinion, any components removed for examination.

3. In the absence of other criteria, the concept of "systematic defect" of a type of rear marking plate in use shall be interpreted in conformity with the intention of paragraph 6.1. of this Regulation.

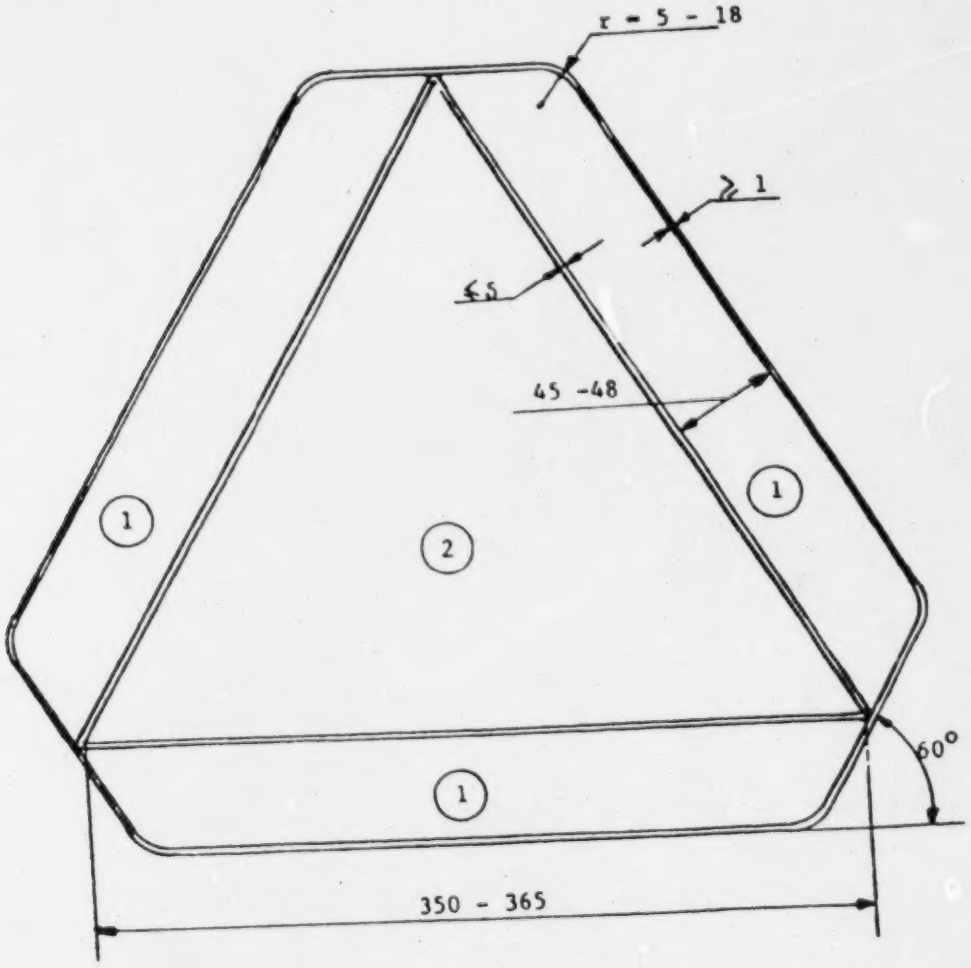
1/ Despite the importance of tests to check the stability in time of the optical properties of rear marking plates, it is in the present state of the art not yet possible to assess this stability by laboratory tests of limited duration.

Annex 12

REAR MARKING PLATES FOR SLOW-MOVING VEHICLES
AND THEIR TRAILERS

Example

All dimensions in mm



(1) red retroreflecting material or corner cube retroreflector

(2) red fluorescent material